



### Site 173 Essex County Greenbelt Association Cox Reservation

**Overview:** The Cox Reservation potential restoration site is located along Route 133 approximately 450 ft west of the Ebben Creek crossing in Essex. The site encompasses approximately 2 ac of primarily salt marsh upstream of an existing driveway crossing which serves the ECGA Cox Reservation Headquarters. The drive also serves two private residences further to the north along the Essex River. Tidal flow is conveyed under the driveway via a stone box culvert. Further upstream from the drive, the small tidal creek is also crossed by a line of large stones and a second private driveway. Upstream of the private driveway, the wetland includes emergent marsh and forested wetland. While both this crossing and the current drive to the Cox Reservation appear on the 1893 USGS 15 Minute Series Salem, MA Quadrangle map, neither are shown extending behind the Reservation to the Essex River. The creek within the potential restoration site is an unnamed tributary to Ebben Creek which joins the Essex River approximately 0.5 mi north of the Route 133 crossing. The Cox Reservation driveway is relatively low lying but is infrequently overtopped by storms. Tide gauge data collected in early June of 2005 documented a maximum restriction of approximately 0.3 feet, but little restriction during more typical spring tide conditions. Biological benchmark data did not find major differences in the elevations of high marsh on either side of the crossing. However, *Iva* along with several brackish species are more prevalent upstream of the crossing.

**Structure conditions:** A stone culvert conveys tidal flows from a small creek under the Cox Reservation driveway. The stone culvert is approximately 2.0 ft wide by 1.5 ft high. Cut stones form a retaining wall along either side of the crossing. The gravel driveway is approximately 15 ft wide and is in fair condition. Some road maintenance problems are experienced during wet soil conditions requiring the re-stacking of fallen stones from the headwall and minor regrading. ECGA currently has no plans to improve the crossing. A new sewer connection is planned by tying to a new service line to be installed down the paved driveway. The creek continues upstream and is conveyed under the paved driveway to a private residence via a 12" ductile iron culvert. This crossing appears in good condition. Flow within the creek and overland marsh flow between the two culverts is partially obstructed by the remains of an earlier road crossing. Both culverts are considered to be in fair condition and their life expectancy is estimated to be over 15 years. There is approximately 4.5 feet of cover over the culvert.

**Ecological Integrity:** The potential restoration site generally has a medium level of ecological integrity. Approximately half of the site is held in conservation by ECGA including the access drive with the remaining area being privately held. The site is contained within the Parker River/Essex Bay ACEC and BioMap Core Habitat. Land uses are residential and agricultural. The upper reaches of the wetland system, above the private driveway crossing, include freshwater marsh dominated by purple loosestrife and *Typha* and forested wetland dominated by green ash and red maple. These wetlands lie above the influence of tidal flows and are not included within the potential restoration area. Habitat types within the restoration area include high and low marsh and a narrow zone of brackish marsh just below the private driveway crossing. The brackish marsh includes purple loosestrife along with *Typha*, *Spartina pectinata* and *Phalaris*. There appears to be substantial fresh water contributions to the site from the upstream watershed. This freshwater lens is influencing the plant community within the western end of the restoration area. There is also an increase in the amount of *Iva* growing upstream of the former road crossing. Stones from this former roadbed obstruct flow to some extent which may be reducing salinity levels within the peat upstream of this point. There does not appear any appreciable restriction to upstream fish passage through the culvert under the Cox Reservation driveway. The Essex River downstream of the site includes substantial soft shell clam beds.



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Two tide gauges were deployed on either side of the Cox Reservation driveway from June 3 to July 8, 2005. Results of the deployment show that the culvert creates a restriction to tidal flow upstream of the road when the height of the high tide downstream of the culvert increases above the elevation of 6 ft (NGVD). Twelve out of 67 tidal cycles recorded during the deployment period reached this elevation downstream of the driveway resulting in less than 0.1ft to 0.35 ft of dampening and delays of less than 10 minutes to 37 minutes. The highest tide recorded at the downstream gauge during the deployment period occurred at 12:34 AM on June 23<sup>rd</sup>. The tide height downstream of the culvert was 7.52 ft NGVD. The tide height upstream of the culvert was 7.17 ft and occurred at 1:11 AM. There was a tidal dampening of 0.35 ft and a delay of 37 minutes due to the tidal constriction at the culvert. The dampening amounted to approximately 6% of the total tidal prism recorded at the downstream gauge. Tides below 6 ft, which are more typical of spring tide conditions, were not substantially reduced by the culvert crossing.

Relatively low salinities of 1.9 and 1.7 ppt (downstream and upstream, respectively) were recorded on a near slack, ebbing tide. These values are indicative of significant freshwater contributions to marsh system.

The overall severity of the existing impairments is considered minimal. The removal of the stones obstructing drainage and limited ditching within the western end of the site may help to increase salinity levels and control the advance of purple loosestrife and *Iva*. Elimination of the loosestrife within the restoration area will have limited success without control measures within the large upstream seed source. This upstream freshwater marsh appears well suited for biological control with *Galerucella* beetles. Replacing the stone culvert under the Cox Reservation is not anticipated to provide measurable ecological benefits. No impacts to other wetland communities upstream of the private driveway would be affected. No impacts to abutting developed lands are anticipated.

**Socioeconomic:** Recreational values and educational opportunities of the potential restoration site are enhanced by the excellent public access, parking and wildlife viewing opportunities provided by the ECGA conservation lands. However, there is no known ongoing research or nearby schools. The site's Uniqueness/Heritage value is enhanced by its inclusion within the Parker River/Essex Bay ACEC. The potential restoration site does not include any known cultural resource elements or urban setting values.

**Construction Logistics/Feasibility:** There are few constraints associated with installing a larger replacement culvert at the Cox Reservation driveway. There are no known underground or overhead utility concerns. A connection to the recent sewer extension is planned for the private driveway which the Reservation Headquarters will tie into north of the restoration area. Existing overhead utilities currently pass over the marsh near the former road bed location. Extensive water control would also not be necessary. Reservation staff have expressed an interest in maintaining a historical feel to a replacement culvert but there are no known regulatory historic constraints. Costs for replacing the culvert were based on a four ft wide box culvert similar to the width of the creek. Work on the site should also include the removal of stones within the creek further upstream, as well as minor ditching along the private driveway to increase tidal circulation and drain accumulated fresh water. The estimated cost of these combined activities is \$100,000. The work would have the support of the ECGA, support of the town and adjacent property owner is unknown at this time.


**Restoration Potential:** The site is considered to have low restoration potential based primarily on the relatively high per acre cost of restoration and the generally low level of current ecological impairments. Replacement of the culvert would have few complicating factors and would be relatively inexpensive. However, the size of the restoration area is small and the benefits to be derived from an enlarged culvert do not appear to justify the expense. Due to the site's location,





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the restoration effort would have excellent public outreach and education opportunities. Even without the culvert replacement, the removal of the stones obstructing the ditch further upstream from the Cox Reservation, along with improved ditching near the private driveway should be considered. Further studies should focus on the level of interest of the ECGA, the Town and private land owner to undertake the project. The obstruction removal and ditching work could easily be accomplished by the Town.

 Potential Restoration Site

 Photo Locations

 Tide Gauges

 Benchmark

 Ground Elevation



Essex County Greenbelt  
Cox Reservation

Stone  
Wall

Driveway  
Culvert

Route 133







**Photo 1 - Restoration Area Upstream of Driveway Crossing Viewing West**



**Photo 2 - Downstream End of Driveway Culvert**







**Photo 3 - Salt Marsh Downstream of Driveway Crossing**



**Photo 4 - Remains of Stone Wall Across Creek**







**Photo 5 - Restoration Area Viewed Downstream from Paved Private Drive**



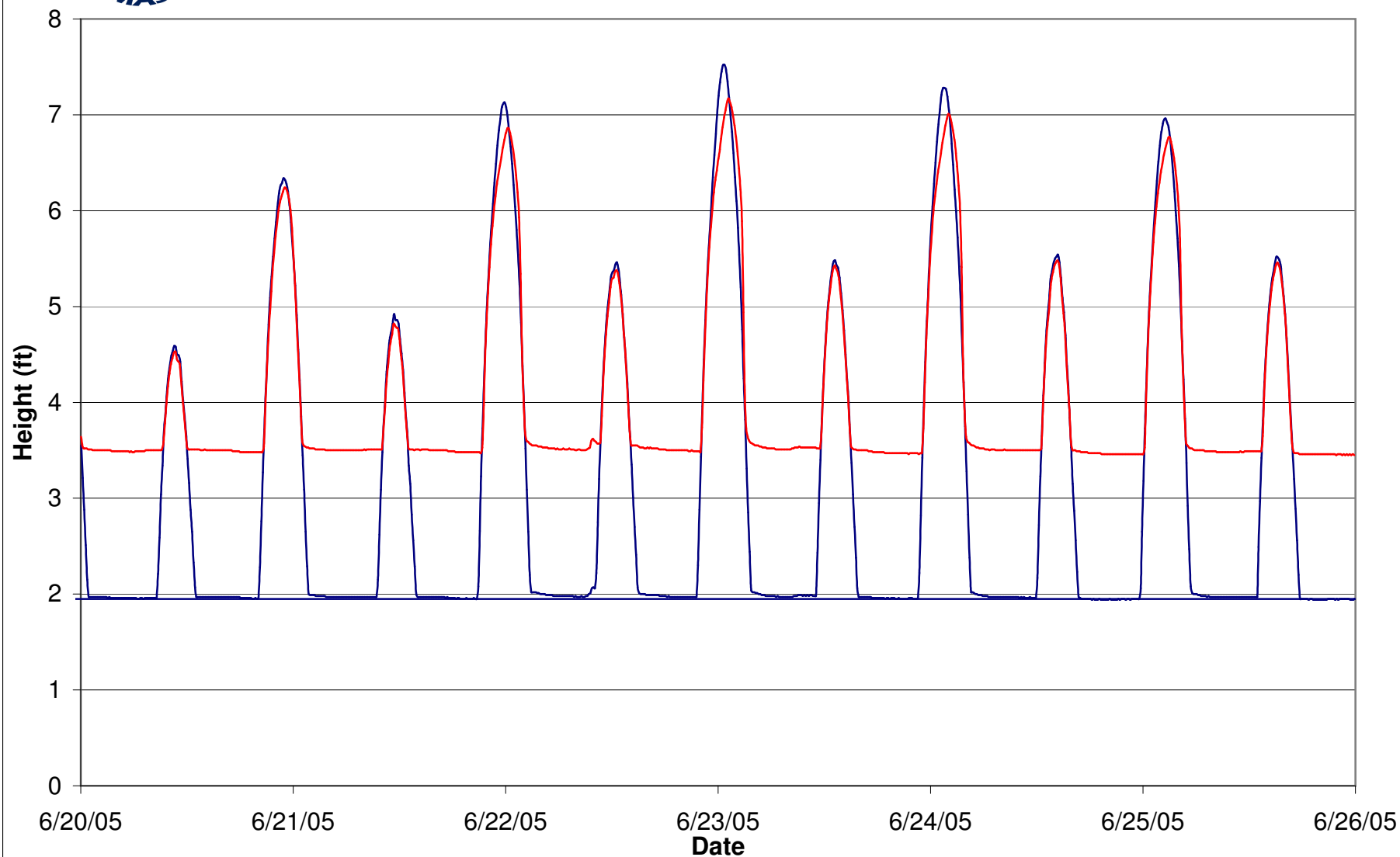
**Photo 6 - Wetlands Upstream of Paved Private Drive**





## Site 173: Greenbelt Cox Reservation, Essex, MA

Down Stream  
Up Stream







# Great Marsh Coastal Wetlands Restoration Planning

## Rapid Field Assessment

Site # 173  
Cox Reservation



### Site Information

Site ID:

Site Name:

Municipality:

Location:

Adjacent Waterbody:

### Affected Area (Acres)

Mudflat/Open Water:  Total Area:

Salt Marsh:

Other Wetland:  Other Description:

Other:

### Impairment(s)

Tidal Restriction ☒ Fill ☐

Obstructed Ditch(es) ☒ Invasive Species ☒

Impoundment ☐ Pollution / Siltation ☐

Severity of Impairments

### Project Type

Roadway Culvert(s) ☒ Obstructed Ditches ☒

Bridge ☐ Fill ☐

Berm ☐ Other

### Evidence of Restriction

Gauge Data ☒ Impounded Flow ☐

Downstream Scour Pool ☐ Obstructed Flow ☒

Upstream Scour Pool ☐ Invasive Species ☒

Bank Erosion ☐ Ponded Conditions ☐

Slumping ☐ Subsidence ☐

### Structure / Channel:

Overall Condition:

Life Expectancy (Years):

Road Condition:

Structure Type:

Structure Age (Years):

Structure 1 Width (Feet):

Structure 1 Length (Feet):

Structure 2 Width (Feet):

Structure 2 Length (Feet):

Skew (Degrees):

Cover (Feet):

Scour Protection: ☐

Adequately Aligned: ☒

Headwall Type:

Headwall Condition:

### Ecological Integrity / Habitat Value

Surrounding Land Use %

Commercial / Industrial

Residential

Agricultural

Undeveloped

Severity of Impairment(s)

Invasive Plant Cover:

Extent of Wooded Buffer:

Habitat Connectivity:

NHESP Estimated Habitats of Rare Wildlife: ☐

NHESP Priority Habitats of Rare Species: ☐

NHESP BioMap Core Habitat: ☒

NHESP BioMap Supporting Natural Landscape: ☐

ACEC: ☒

Anadromous Fish: ☐

Shellfishing Suitability: ☒

Barriers to Fish Passage



# Great Marsh Coastal Wetlands Restoration Planning

## Rapid Field Assessment

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### Construction Logistics / Feasibility

Traffic Volume	<input type="text" value="Low"/>
Detour Potential	<input type="checkbox"/>
Site Access	<input type="text" value="Good"/>
Staging Areas	<input checked="" type="checkbox"/>
Fill Material Concern	<input type="text" value="Minimal"/>
Low Lying Property Concerns	<input type="text" value="None"/>
Overhead Utility Constraint	<input type="text" value="Minimal"/>
Underground Utilities	
Water <input type="checkbox"/>	Telephone <input type="checkbox"/>
Gas <input type="checkbox"/>	Sewer <input type="checkbox"/>
Electric <input type="checkbox"/>	Drainage <input type="checkbox"/>
Permitting Complexity	<input type="text" value="Low"/>
Local Support	<input type="text" value="Unknown"/>
Feasibility Cost	<input type="text" value="15,000"/>
Design Cost	<input type="text" value="25,000"/>
Permitting Cost	<input type="text" value="25,000"/>
Construction Cost	<input type="text" value="100,000"/>
Total Cost	<input type="text" value="165,000"/>
Relative Cost/Acre	<input type="text" value="18,000"/>

### Socioeconomic

<b>Recreation</b>	<b>Education</b>
Public Access: <input checked="" type="checkbox"/>	Schools Nearby: <input type="checkbox"/>
Watercraft / Portage: <input type="checkbox"/>	Ongoing Research: <input type="checkbox"/>
Wildlife Viewing: <input checked="" type="checkbox"/>	Education / Outreach Potential: <input type="text" value="High"/>
	Safety Concerns (Access): <input type="text" value="Low"/>
<b>Uniqueness / Heritage Value</b>	
Rare Species Habitat: <input type="checkbox"/>	
ACEC: <input checked="" type="checkbox"/>	
Cultural Resource Features <input type="checkbox"/>	
Urban Viewscape Value: <input type="text" value="None"/>	
Urban Habitat Value: <input type="text" value="None"/>	

### Tide Surveys

	<i>Start:</i>		<i>Finish:</i>
<b>Dates of 1st Survey:</b>	<input type="text" value="6/3/2005"/>	-	<input type="text" value="7/8/2005"/>
Date of Highest Tide:	<input type="text" value="6/23/2005"/>		
Max Measured Tidal Dampening:	<input type="text" value=".35"/>		
Percent of Tidal Prism:	<input type="text" value="6"/>		
Measured Delay:	<input type="text" value="37 min"/>		
	<i>Start:</i>		<i>Finish:</i>
<b>Dates of 2nd Survey:</b>	<input type="text"/>	-	<input type="text"/>
Date of Highest Tide:	<input type="text"/>		
Max Measured Tidal Dampening:	<input type="text"/>		
Percent of Tidal Prism:	<input type="text"/>		
Measured Delay:	<input type="text"/>		

### Summary

Uniqueness / Heritage Value:	<input type="text" value="Medium"/>	Ecological Integrity:	<input type="text" value="Medium"/>
Recreational Value:	<input type="text" value="Medium"/>	Logistics / Feasibility:	<input type="text" value="High"/>
Educational Value:	<input type="text" value="Medium"/>		
<b>Restoration Potential:</b>			<input type="text" value="Low"/>